



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/808,333	03/25/2004	Kazuhito Tsukagoshi	2870-0277PUS1	5434

2292 7590 04/02/2009  
BIRCH STEWART KOLASCH & BIRCH  
PO BOX 747  
FALLS CHURCH, VA 22040-0747

EXAMINER
----------

QUACH, TUAN N

ART UNIT	PAPER NUMBER
----------	--------------

2893

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

04/02/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/808,333	<b>Applicant(s)</b> TSUKAGOSHI ET AL.	
	<b>Examiner</b> Tuan N. Quach	<b>Art Unit</b> 2893	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 March 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 3-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2 March 3 2009 and 8 December 2008 have been entered.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Awano in view of Webster.

Re claims 1 and 21, Awano 7,084,507 teaches device formation of wiring structure including metal and an intervening carbon nanotube where the metal, e.g., drain electrode 222, contacts the carbon nanotube, e.g., 220a and wherein the carbon nanotube is in contact with the component regions in substrate 202 and wherein the semiconductor material 202/204 and the metal, e.g., 222, do not directly contact each other. The carbon nanotube thus is employed for connection to device elements as well for interconnection therebetween. The advantages include improved reliability, good migration resistance, improved device characteristics among others. See the abstract, Fig. 19C, column 3 line 31 to column 4 line 45, column 6 lines 30-58, column 9 lines 21-36, column 17 line 13-54. Re claim 21, additionally, this claim corresponds to similar limitations in claim 1 with the additional recitation that the carbon nanotube comprises six-membered rings in contact with the 6-membered carbon ring of the organic material. Awano is applied as above further and teaches carbon nanotube to be six-membered rings, column 6 lines 32-34, column 24 lines 3-38. Awano as applied is not limited to silicon, or any semiconductor material (e.g., column 23 line 53, column 24 line 62) but does not explicitly recite the use of the semiconductor material in which the device component being formed to include organic semiconductor material having a 6-membered carbon.

Webster (Wiley Encyclopedia of Electrical and Electronics Engineering, John Wiley & Sons, 1999, vol. 15, pp. 419, 429-434) teach organic materials

Art Unit: 2893

including conjugated polymers, pentacene, thiophene, which comprise 6 carbon ring, see, e.g., instant specification page 12 lines 1-11 regarding similar organic materials) as conventional semiconductor materials having semiconducting properties and high electronic conductivity that can be prepared by simple fabrication. The organic materials are further taught to be light weight, flexible, conformable and are produced by simple manufacturing technologies which make them potentially very inexpensive compared to inorganic semiconductor materials. See page 419, left column, lines 21 to last line. Further advantages of organic materials and their applications to semiconductor devices are delineated, tunability of electronic bandgap, processability of the materials on a large scale, substantial reduction of production cost. The various organic materials including anthracene, fullerene, etc., which comprise 6 carbon membered ring, see instant specification, page 12 lines 1-11, regarding similar materials). See page 429, right column.

It would have been obvious to one skilled in the art in practicing Awano invention to have employed as the semiconductor material organic semiconductor materials including 6-membered ring as taught in Webster since such use is conventional and advantageous as documented by Webster as delineated above, including organic materials having semiconducting properties and high electronic conductivity that can be prepared by simple fabrication, and include further advantages such as light weight, flexible, conformable and are produced by simple manufacturing technologies which make them potentially very inexpensive compared to inorganic semiconductor materials, tunability of

Art Unit: 2893

electronic bandgap, processability of the materials on a large scale, substantial reduction of production cost, among others. Additionally, re claim 21, the use of carbon nanotube comprising six-membered carbon ring is conventional and obvious as evidenced by Awano above, and in the alternative, the carbon nanotube comprising such six-membered rings would have been conventional and obvious to one skilled in the art; the contact between the carbon nanotube six-membered rings and the 6-membered ring of the organic semiconductor would logically follow when the respective materials are employed and in contact. Re claim 2, intended use or application to TFTs in claim 2 would have been apparent given the scope of the structures in Awano, which shows field effect transistors, and in any event, is unpatentable as a preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness, but instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

The declaration under 37 CFR 1.132 filed December 2, 2008 is insufficient to overcome the rejection of claims 1 and 2 based upon Awano in view of Webster as set forth in the last Office action because of the following reasons.

Initially, the declaration has been carefully considered but is not deemed to be sufficient to overcome the rejection. In particular, the declaration on the second page delineates that it is not possible to grow a carbon nanotube on a

Art Unit: 2893

substrate of organic material having 6-membered carbon rings since carbon nanotubes require an temperature of about 400° C to grow and that the organic material having a 6-membered carbon ring have a sublimation temperature of approximately 200° to 300° C. This has been carefully considered together with all remaining evidence of obviousness. Nonetheless, this corresponds to an opinion while the subject matter encompassed corresponds to the physical characteristics of the materials and processes in question amenable to being supported or substantiated by empirical data or objective evidence which are presently lacking, namely objective evidence regarding the sublimation of the 6-membered carbon ring or the deposition temperatures requiring 400°C. In any event, the invention is Awano is seen to be applicable to semiconductor devices having wirings including carbon nanotubes as delineated above and is not limited to a particular process or temperature. Awano, e.g., the abstract, recites that the device is preferably employed by method comprising a conventional CVD process but it is evident that such is not required, and that the device therein can be made via a selection of conventional deposition process that is suitable for the substrate material in question. See e.g., Kawakami 2005/0266605 A1, [0047], which evidence that nanocarbon materials can be formed by low temperature processes and Arthur et al. 6,988,925 B2, column 3 line 1 to column 9 line 48, particularly column 4 lines 25-52 wherein it is evidenced that carbon nanotube wiring can be formed on various alternative substrates without imposing detrimental temperatures.

Applicant argues that the obviousness grounds cannot be sustained by mere conclusory statements. This however does not take into consideration the fact that Awano is not limited to silicon as the substrate material and is considered to encompass suitable substrate material and does not exclude or preclude any suitable semiconductor material including the conventional and advantageous organic material in question as evidenced by Webster, wherein such materials are known to have high electronic conductivity, and to be light weight, flexible, conformable, and produced by simple and inexpensive processes. It remains that one skilled in the art would have been motivated to have employed the use of such conventional and advantageous organic semiconductor materials would have been obvious.

Applicant further argues that the carbon nanotube of Awano does not contact the metal and organic material because Awano employs a catalyst, column 17, lines 27-31. Nonetheless, such catalyst can be removed if desired, column 17 lines 31-32. The catalyst is nowhere required or present in the structures of Awano, see, e.g., Figs.2A-4, 18A-20B, column 23 line 50 et seq.

Regarding the argument that the sublimation or decomposition of the substrate, the response above with regard to the declaration would be applicable here as well.

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.



Art Unit: 2893

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Tuan Quach whose telephone number is 571-272-1717. The examiner can normally be reached on M-F from 8:00 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Davienne Monbleau can be reached on 571-272-1945. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Tuan N. Quach/  
Primary Examiner, Art Unit 2893